

Implementation of Remedial Action Guidelines

I. Introduction

One of the more perplexing issues in the remediation of contaminated sites continues to be the determination of "How clean is clean?" Regulators, legislators, potentially responsible parties, developers of contaminated property, and the public are caught in the dilemma of balancing risks and costs. The Maine Department of Environmental Protection (DEP) has been charged with the task of ensuring that the threats posed by hazardous substance sites are abated, cleaned up or mitigated properly. The purpose of this document and the companion Technical Basis and Background for Soil Remedial Action Guidelines Based on Direct Contact (Basis Statement) is to present chemical specific guidelines which may assist in making remedial decisions at hazardous substance sites.

The attached Table 4 presents the guidelines. Chemicals are listed by name and CAS number to ensure the correct identification. Direct Contact guidelines are presented for 3 exposure scenarios: residential, trespasser and adult worker. The default exposure factors for each scenario are described in the Basis Statement. Both the trespasser and the adult worker guidelines are for non-residential exposures. Depending on the contaminant, there may be significant differences, and guidelines protective of one of these populations may not be protective of the other.

Groundwater Guidelines are final Soil Screening Levels (SSLs) prepared by the Environmental Protection Agency and released in 1996. A brief technical summary is available. While DEP recognizes the SSLs are highly conservative, it considers these generic SSLs protective and technically defensible. Furthermore, the SSLs are intended as a default option for use when site specific values are not available. The DEP encourages development of less conservative site specific remedial guidelines using sound investigation and risk assessment techniques. The DEP is adopting these groundwater SSLs as interim guidance and intends to further assess compound specific values for future modification. The technical summary describes data gaps which must be addressed in order to derive less stringent but equally protective groundwater guidelines.

II. Definitions

Anthropogenic: Originating from the actions of people. Associated with the actions of people as distinct from occurring naturally.

Cancer Potency Factor: The Cancer Potency Factor (CPF) describes the slope of the dose-response curve as extrapolated mathematically from high doses in animals to low doses in humans, usually using the linearized multi-stage model. The CPF has units of risk per unit dose, expressed as $(\text{mg}/(\text{kg} \cdot \text{day}))^{-1}$. Since the CPF describes the slope of the dose-response curve, a larger CPF implies a more potent carcinogen.

Contaminant: For the purpose of this guidance, contaminant shall have the same meaning as hazardous substance.

Hazard Index: For chronic non-carcinogenic effects the Hazard Index is estimated as the Average Daily Dose for the chronic exposure period divided by the chronic Reference Dose. For the purpose of these guidelines, the DEP requires that the Hazard Index be 1 or less.

Hazardous Substance:

- A. Any substance identified by the Board of Environmental Protection under section 1319-O;
- B. Any substance identified by the Board of Environmental Protection under section 1319;
- C. Any substance designated pursuant to the United States Comprehensive Environmental Response, Compensation and Liability Act of 1980, Public Law 96-510, Sections 101 and 102 (Superfund);
- D. Any toxic pollutant listed under the United States Federal Water Pollution Control Act, Section 307(a);

- E. Any hazardous air pollutant listed under the United States Clean Air Act, Section 112;
- F. Any imminently hazardous chemical substance or mixture with respect to which the Administrator of the United States Environmental Protection Agency has taken action pursuant to the United States Toxic Substances Control Act, Section 7; and
- G. Waste oil as defined in section 1303-C.

Incremental Lifetime Cancer Risk: The incremental probability of an individual developing cancer over a lifetime as a result of exposure to a chemical.

Institutional Control: A measure to control exposure to contaminants at sites where the remedial action will not meet a residential standard. Institutional controls require a legal mechanism to ensure notification and maintenance of the controls, and to provide a trigger for additional review should the conditions at the site change. Examples of institutional controls include, erection and maintenance of a fence to restrict access, a prohibition on the taking of groundwater, limiting site use to industrial activities, or a requirement that a cap/cover system be maintained. A declaration of covenant running with the land is an example of a legal mechanism.

Neat Material: Liquid or solid hazardous substances which occur in a pure or nearly pure form and which may or may not be in a container. Neat material is distinct from dissolved contamination.

Public Drinking Water Supply: Any well or other source of water that furnishes water to the public for human consumption for at least 15 service connections, or regularly serves at least 25 individuals daily at least 60 days out of the year, or that supplies bottled water for sale.

Reference Dose (RfD): An estimate of the daily exposure to the human population that is likely to be without deleterious effects during a lifetime. Reported in units of mg of substance/kg body weight/day for oral exposures, or mg of substance/m³ of air breathed for inhalation exposures.

Wellhead Protection Area: The surface and subsurface area surrounding a water well or well field, supplying a public drinking water system through which contaminants are reasonably likely to move toward and reach such water well or well field.

III. Eligibility - When Table 4 Guidelines Are Appropriate

A. Minimal Actions Required

The objective of hazardous substance cleanups conducted by, or on behalf of, the Department is to remove threats to human health and the environment posed by the release of hazardous substances. If the threat cannot be removed, it must be mitigated to the extent determined by the Department. The following minimum actions must be taken: 1) threats to public safety (such as the threat of explosions) must be removed, 2) containerized hazardous substances must be removed, and 3) neat materials must be recovered. The Department must consider taking action under the following circumstances and, while not required in all circumstances, prefers removal of the subject substance: 1) substances presenting a nuisance, and 2) substances at levels exceeding regulatory/guidance levels.

B. Ceilings

The Guidance establishes ceiling levels for certain compounds at 1% (10,000 ppm). The Department believes that some upper level of soil contamination should be removed at all sites even though calculated risks from the direct contact pathway are expected to be acceptable. In support of this position is concern that a public safety risk from explosive vapors or public nuisance created by fugitive vapors may be more likely where contaminant concentrations exceed 1%. The Department recognizes that the explosive hazard and odor nuisance factors are variable. The ceiling level is intended to be used as a benchmark. If the concentration of the contaminant of concern (COC) is equal to or less than 10,000 ppm, there is no threat (as defined by this policy) and the COC can be dropped from further consideration. If the COC exceeds 10,000 ppm, additional work must be performed to characterize the nature of any threat posed by the COC.

C. Risk To Ecological Receptors

If the Department believes that hazardous substances in soils pose significant risk to ecological receptors it may require an ecological assessment before considering the Table 4 guidelines applicable to the site.

D. Background Contamination

If site contaminants are substances which might occur naturally at the site, the contamination levels must exceed background before action is required. If contaminants are not generally expected to be naturally occurring in Maine, their presence at any level requires action.

F. Institutional Controls

The Department accepts the use of institutional controls on a case by case basis. At a minimum the following conditions must be met:

1. Notice provisions must provide adequate notification of the institutional control(s) to future owners of the property and/or operators at the site. The notice shall include the condition(s) imposed by the institutional controls and clearly define the party responsible for maintaining the institutional control.
2. Required oversight and maintenance of any institutional control must be enforceable.

Institutional controls where a single authority has control over the land use and/or groundwater is preferred. This can mean property ownership, regulatory permitting, and control of the facilities needed to use the land or groundwater.

Institutional controls can be used in the case of an industrial/commercial remedial action where the remedial action objective does not require meeting a residential standard. The institutional control must provide adequate protection to prevent the site from being developed as a residential area without additional remedial action.

Institutional controls shall be structured in such as fashion that they remain protective for the life of the selected remedy.

IV. How to Use Table 4 Numbers

A. Table 4 Numbers are Remedial Action Guidelines

The Table 4 Direct Contact Guidelines should not be used as screening levels.

Remedial action guidelines which are protective of human health by direct exposure do not necessarily prevent continued degradation of groundwater resources. Leaching of these compounds may result in increased concentrations of the compounds in the groundwater and plume spreading.

The Table 4 Guidelines are default remedial action guidelines. A site specific risk assessment, conducted in accordance with Maine's Guidance Manual for Human Health Risk Assessment may be conducted to support site specific remediation levels.

B. Applicability of Groundwater Protection Remedial Action Guidelines

Maine law requires that all groundwater be free of anthropogenic contamination in order to protect drinking water supplies and ecological resources. Therefore, the Department will generally require that unlicensed discharges of hazardous substances be remediated to levels that will not create, increase or maintain groundwater pollution. The default soil remedial action guidelines for groundwater protection are based on soil screening levels (SSLs) published in the Soil Screening Guidance: Users Guide by the USEPA (1996). When there is sufficient site data, scientifically based, verifiable standards protective of groundwater may be calculated on a site specific basis

(examples include various leaching models, use of SPLP (synthetic precipitation leaching procedure) or TCLP (toxicity characteristic leaching procedure)).

1. The Department may allow exemptions to the policy that cleanup standards be protective of groundwater on a case by case basis when the following situations are clearly documented:
 - a. The existence of groundwater contamination will not have any present or future adverse impact on human health, water supplies or ecological resources; or,
 - b. Where passive or active measures, including permanent, enforceable institutional controls, are taken to permanently mitigate or eliminate current and future threats to human health and the environment; or,
 - c. It is not technically and/or economically feasible to clean up discharges and mitigative measures as in B can be applied.
2. The following represent situations where the Department may allow exemptions. The Department may allow the establishment of alternative cleanup standards.
 - a. Remediation to standards protective of groundwater is technically impracticable.
 - b. The underlying geology will prevent contaminant migration to or in groundwater.
 - c. The area is served by public water and:
 1. No potential or existing water supply sources are located in the contaminant source or potential groundwater plume areas; and
 2. On site groundwater extraction will be controlled by institutional controls approved by the Department.
 - d. Groundwater is non-potable due to the presence of prior contamination. The non-potability must be caused by a responsible party not in the chain of title of, or formerly involved in a business relationship on, the subject site.
3. The following are examples of situations where the Department is not likely to approve alternate standards:
 - a. The area of the contaminant source and potential groundwater contamination plume is not served by public water.
 - b. The area of the contaminant source and potential groundwater contamination plume are over or upgradient of a sand and gravel aquifer or high yield bedrock aquifer or a recharge zone for either one.
 - c. Prior to the discharge, the area of the contaminant source and potential groundwater contamination plume was known to be clean.
 - d. The area of the contaminant source and potential groundwater contamination plume are within any wellhead protection area.
 - e. Where discharge of contaminated groundwater to the ground surface or surface water causes or may cause a violation of surface water quality standards, adversely impacts ecological resources, or otherwise adversely impacts human health and safety standards.
 - f. The area of the contaminant source and potential groundwater contamination plume are within a sole source aquifer.

C. Multiple Contaminants

In order to attain the acceptable level of total site risk of Hazard Index of 1 or less and Incremental Lifetime Cancer Risk of 10⁻⁵ or less, the soil guidelines shall be adjusted as follows:

1. Method 1

For each carcinogenic contaminant of concern, the generic guideline shall be divided by the total number of contaminants at the site. For each noncarcinogenic contaminant of concern, the generic guideline shall be divided by the total number of noncarcinogenic contaminants at the site. A site specific risk assessment may be conducted in lieu of this procedure.

2. Method 2

The sum of the ratios of final site contaminant concentrations to chemical specific cleanup guidelines must be less than or equal to 1.

$$\frac{\text{Final cleanup guideline (a)}}{\text{Generic guideline (a)}} + \frac{\text{Final cleanup guideline (b)}}{\text{Generic guideline (b)}} + \dots \frac{\text{Final cleanup guideline (n)}}{\text{Generic guideline (n)}} \leq 1$$

where a, b and n are site contaminants

V. Policy and Intent

It is the policy of the Department to prevent degradation of the environment by establishing licensing limits based on criteria more stringent than remedial action criteria. In keeping with this policy, the maximum incremental lifetime cancer risk at contaminated sites shall be one in one hundred thousand (10⁻⁵) and a maximum total site hazard index of one.

VI. Technical Notes

A. Reference to Basis Statement(s)

The Direct Contact Guidelines were derived based on the Guidance Manual for Human Health Risk Assessment at Hazardous Substance Sites (Manual) finalized by DEP and the Department of Human Services (DHS) in June of 1994. A document entitled Technical Basis and Background for Soil Cleanup Guidelines Based on Direct Contact is available from DEP on request. This document describes the calculations and default exposure assumptions used to develop the guidelines.

The Groundwater Guidelines are final Soil Screening Levels (SSLs) prepared by EPA and released in 1996. The SSL Fact Sheet, User's Guide and Technical Background Document are available from EPA. A brief technical summary is available from DEP.

B. Notes on Residential and Non Residential Lead Guidelines

The residential direct contact standard for lead was established by DHS. DEP has consulted with DHS regarding acceptable nonresidential guidelines.

C. Note on PCB Numbers

DEP has requested DHS review of the dermal risk posed by PCB. Guidelines derived following the procedures outlined in the Manual are below levels accepted by DHS in the past. In lieu of a site specific risk assessment, the PCB levels in Table 4 should be considered default remedial action guidelines until DEP and DHS complete their review.

Table 4 - Remedial Action Guidelines for Contaminated Soils							
CHEMICAL	CAS Number	Residential Guideline (mg/kg)	Trespasser Guideline (mg/kg)	Adult Worker Guideline (mg/kg)	Basis	Groundwater Guideline (mg/kg)	Basis
1,1,1-Trichloroethane	71-55-6	260	1840	350	Inhalation, NC	2	SSL
1,1-Dichloroethane	75-34-3	645	4520	860	Inhalation, NC, Ceiling	23	SSL
1,1-Dichloroethene	75-35-4	0.2	3	0.3	Inhalation, C	0.06	SSL
1,1,1,2-Tetrachloroethane	630-20-6	660	2400	2140	Ingestion, C	.	.
1,1,2-Trichloroethane	79-0-5	3	70	7	Inhalation, C	0.02	SSL
1,2-Dichlorobenzene	95-50-1	2670	10000	3560	Inhalation, NC, Ceiling	17	SSL
1,2-Dichloroethylene (trans)	156-60-5	135	940	180	Inhalation, NC	0.7	SSI
1,2,4-Trichlorobenzene	120-82-1	540	3800	720	Inhalation, NC	5	SSL
2,4-Dichlorophenol	120-83-2	16	112	22	Inhalation, NC	1	SSL
2,4,5-T	93-76-5	1900	10000	10000	Ingestion, NC, Ceiling	.	.
2,4,5-TP	95-95-4	10000	10000	10000	Ceiling	270	SSL
Acetone	67-64-1	475	3330	635	Inhalation, NC	16	SSL
Alachlor	15972-60-8	210	780	700	Ingestion, C	.	.
Aroclor 1016	12674-11-2	0.1	0.2	0.4	Dermal, C	.	.
Arsenic	7440-38-2	10	30	30	Ingestion, C	29	SSL
Atrazine	1912-24-9	6650	10000	10000	Ingestion, NC, Ceiling	.	.
Barium	7440-39-3	10000	10000	10000	Ceiling	1600	SSL
Benzene	71-43-2	5	105	10	Inhalation, C	0.03	SSL
Benzo(a)pyrene (cPAH)	50-32-8	2	9	7	Ingestion, C	8	SSL
Beryllium	7440-41-7	4	15	10	Ingestion, C	63	SSL
Bis(2-ethylhexyl) phthalate	117-81-7	1220	4460	3970	Ingestion, C	3600	SSL
Cadmium	7440-43-9	27	35	23	Dermal, NC	8	SSL
Chlordane	57-74-9	9	50	20	Inhalation & ingestion, C & NC	10	SSL
Chlorobenzene	108-90-7	310	2180	415	Inhalation, NC	1	SSL
Chromium (+6)	18540-29-9	950	5350	10000	Ingestion, NC, Ceiling	38	SSL
Copper	7440-50-8	650	600	600	New Jersey	.	.
Cyanide	57-12-5	3800	10000	10000	Ingestion, NC, Ceiling	40	SSL
DDT	50-29-3	50	180	160	Ingestion, C	32	SSL
Dieldrin	60-57-1	0.3	4	0.6	Inhalation & Ingestion, C	0.004	SSL
Dinoseb	88-85-7	5	35	7	Inhalation, NC	.	.
Endosulfan	115-29-7	17	120	22	Inhalation, NC	18	SSL
Endrin	72-20-8	60	320	80	Inhalation & Ingestion, NC	1	SSL
Ethylbenzene	100-41-4	1670	10000	2210	Inhalation, NC, Ceiling	13	SSL
Heptachlor	76-44-8	4	14	12	Ingestion, C	23	SSL
Lead	7439-92-1	375	700	700	DHS, Ceiling	.	.

Malathion	121-75-5	3800	10000	10000	Ingestion, NC, Ceiling	.	.
Mercury	7439-97-6	60	320	610	Ingestion, NC	2	SSL
Methyl Ethyl Ketone	78-93-3	10000	10000	10000	Ceiling	.	.
Methylene Chloride	75-9-2	13	275	28	Inhalation, C	0.02	SSL
Molybdenum	7439-98-7	950	5350	10000	Ingestion, NC	.	.
Napthalene(PAH)	91-20-3	245	1710	325	Inhalation, NC	84	SSL
Nickel	7440-2-0	3800	10000	10000	Ingestion, NC	130	SSL
Parathion	56-38-2	1140	6420	10000	Ingestion, NC	.	.
PCBs	1336-36-3	2.2	8.1	7.2	Ingestion, C	.	.
Pentachlorophenol	87-86-5	1	21	2	Inhalation, C	0.03	SSL
Selenium	7782-49-2	950	5350	10000	Ingestion, NC	5	SSL
Silver	7440-22-4	950	5350	10000	Ingestion, NC, Ceiling	34	SSL
Tetrachloroethylene	127-18-4	3	65	7	Inhalation, C	0.06	SSL
Thimet (Phorate)	298-2-2	40	210	400	Ingestion, NC	.	.
Toluene	108-88-3	2390	10000	3190	Inhalation, NC, Ceiling	12	SSL
Trichloroethene	79-1-6	19	400	40	Inhalation, C	0.06	SSL
Vinyl Chloride	75-1-4	0.04	0.8	0.1	Inhalation, C	0.01	SSL
Xylene	1330-20-7	10000	10000	10000	Ceiling	190	SSL
Zinc	7440-66-6	1500	1500	1500	New Jersey	12000	SSL
TOP							
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Key:

C--Carcinogen

NC--Non carcinogen

DHS--Maine Department of Human Services, recommended guideline

New Jersey--New Jersey Department of Environmental Protection and Energy, 1992 Proposed Rule Cleanup Standards for Contaminated Sites, NJAC 7:26D

SSL--US Environmental Protection Agency, Soil Screening Guidance, May 1996